and professor's private room. In addition, this department has the use of the flat roof over a portion of the floor below. This open space will be utilised for maceration and similar purposes. Associated with the zoological department is the marine laboratory which is about to be erected at Cullercoats, on the coast just north of Tynemouth (see p. 228).

The ventilation of the front wing is provided for by two electrically-driven fans in the tower, which exhaust from the rooms on the several floors. The heating is by means of steam on the new so-called atmospheric system, and the lighting is by 240-volt electric lamps, which can either be supplied from the college central station or from the town supply. Electric arc lanterns are provided in several of the lecture rooms.

The large public hall, in which the chief portion of the opening ceremony is to take place, will accommodate, with the gallery at the south-west end, an audience of about 800.

The foundation-stone of the new buildings was laid by Mr. T. G. Gibson, a member of council and the most generous supporter of the college, on May 2, 1904, and the buildings have been erected to the designs and under the supervision of Mr. W. H. Knowles, of Newcastle.

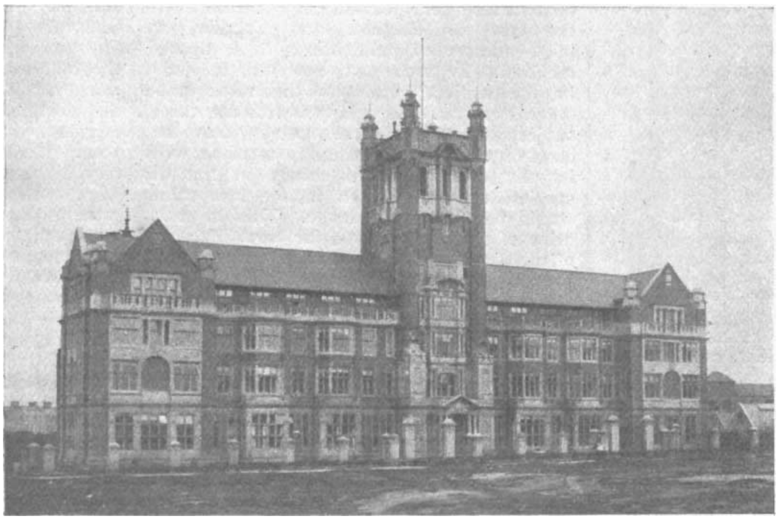

FIG. 1.—New front wing (facing west) of Armstrong College, to be opened by the King on July 11. In the centre is the Sir Lowthian Bell tower.

The cost of the new buildings, together with the fittings, has been nearly 80,000*l*. The funds have been provided by public subscription, and since the buildings are intended as a memorial to the first Lord Armstrong, one of Newcastle's most distinguished citizens and benefactors, the name of the college was in 1904 changed from the Durham College of Science to Armstrong College in the University of Durham. The area of the grounds within which the college stands is between five and six acres. The present buildings occupy about two acres, and more than two acres, excluding roads, &c., are available for the extensions that are being projected. The accompanying photograph shows the front of the college, which forms the west wing.

The number of day students attending the college last session was 539, and in addition about 1100 students attended the evening and special Saturday classes. The college forms an important part of the University of the North of England. The degrees of Durham in science and letters, and its diplomas in agriculture, engineering, and mining are open to students of the college. The Warden of the University (the Dean of Durham) is the president of Armstrong College, Sir Isambard Owen is the principal, and Mr. F. H. Pruen is the secretary.

INTERNATIONAL SCIENCE.[1]

THE pursuit of science has always joined in sympathy men of different nationalities, and, even before the day of rapid letter-post and quick travelling, intercourse, especially by correspondence, exercised a considerable influence on scientific activity. Such intercourse was, however, of a personal and purely stimulating character, and only quite exceptionally was there any direct attempt to organise investigations which required a combination of workers in different localities. Within the last century, however, many problems became urgent which could not be solved without some international agreement, and special organisations came into life which have rendered a service the importance of which cannot be exaggerated.

At present we are confronted with a new difficulty. International combination has become so necessary, and organisations have in consequence increased to such an extent, that they begin to overlap, and there has been some danger of mutual interference. Fear has also been expressed that any attempt to advance knowledge by an organised combination of workers might discourage private efforts, and therefore do mischief rather than good. It must be acknowledged that this danger exists. The proper function of combination must be clearly separated from that of private enterprise, and some general regulating control is therefore called for. The time seems ripe for a general review of the situation.

We may distinguish between three types of international organisations. The first aims simply at collecting information, the second is intended to fix fundamental units or to initiate agreements on matters in which uniformity is desirable, while by the third type of organisation a more direct advance of knowledge is aimed at, and research is carried out according to a combined scheme. Generally, an international association does not entirely fall within any single one of these divisions, but it is useful to draw the distinction and classify the associations according to the main object which they are intended to serve.

The best example of an organisation formed for the purpose of collecting information is furnished by the great undertaking initiated by our Royal Society, and having for its object the systematic cataloguing of the scientific literature of the world, both according to subjects and authors. Twenty-nine countries (counting the four Australian colonies separately) are actively participating in this work by furnishing slips containing the entries which form the basis of the catalogue. A still larger number of countries assist by subscribing to the annual volumes.

The subjects included in the catalogue are classified according to seventeen branches of science as follows:—

A Mathematics	G Mineralogy	N Zoology
B Mechanics	H Geology	O Anatomy
C Physics	J Geography	P Anthropology
D Chemistry	K Palæontology	Q Physiology
E Astronomy	L Biology	R Bacteriology
F Meteorology	M Botany	

Subscribers may either obtain complete sets or any of the separate volumes. The relative popularity of the different subjects is illustrated by the following table, which gives in the different columns for each science the volumes approximately required by each country. The figures are, of course, subject to variations from year to year. The first column shows the number of complete sets subscribed

1 Discourse delivered at the Royal Institution on Friday, May 18, by Prof. Arthur Schuster, F.R.S.

for, in addition to the separate volumes; these presumably find their way into the university or public libraries.

	Sets	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R
Russia	14	2	2	11	6	18	15	19	20	20	13	8	38	30	5	14	8	8
France	27	4	5	11	17	4	3	10	7	5	6	15	13	12	7	3	18	16
Switzerland .	7																	
Canada	7																	
Holland......	5	1	2	1	3	1	2	1	2	3	1	4	3	3	1	1	2	3
Greece	2																	
Hungary ..	4																	
Norway	3			1	1		1						2	4	1	1	2	
India	29	5	4	7	5	2	5	2	3	4	2	5	14	5	2		4	6
UnitedStates	62	11	14	17	14	10	11	8	12	10	7	9	12	10	3	3	7	9
Great Britain	29	5	7	18	17	6	8	8	8	5	4	6	6	5	6	6	7	13
Austria	4	1	2	4	2	1	4	3	5	6	2	4	4	5	1	3		1
Cape of Good Hope	6				1			2	2		2			1				
Denmark ...	6																	
Egypt	1																	
Finland......	1	1	2	2	2	1	1	2	3	1	1	1	2	2	1	1	2	1
Germany ...	44	6	8	14	18	2	5	3	4	5	1	13	9	8	5	2	18	7
Italy	27																	
Japan.........	15																	
Mexico	5																	
New South Wales ...	2																	
Nova Scotia	1																	
Orange Riv. Colony ...	1																	
Poland	1																	
Portugal ...	1																	
Queensland	2																	
S. Australia	2																	
Sweden	5																	
Victoria	1																	
W. Australia	1																	
Total	315	36	46	86	86	45	55	58	66	59	39	65	103	85	32	34	68	64

The popularity of the special botanical catalogue is remarkable.

We may obtain a rough idea of the scientific activity of different countries by comparing the number of slips received from them during a certain interval. The numbers given in the report published by the International Convention held in London last summer, and referring to all slips received, are shown in the following table:—

	Slips received	Number of journals	Average number of slips per journal
Austria	13,186	535	25
Belgium	2,272	174	13
Canada	537	45	12
Denmark	2,584	40	64
Finland	1,828	33	55
France	60,401	930	65
Germany	213,545	1,397	153
Holland	9,861	70	141
Hungary	2,605	35	75
India and Ceylon	2,699	31	87
Italy	21,238	300	71
Japan	3,043	42	72
New South Wales	2,049	8	256
New Zealand	440	1	440
Norway	2,017	36	56
Poland	5,830	65	90
Russia	25,741	457	56
South Africa	1,872	15	125
South Australia	159	6	26
Sweden	1,939	63	31
Switzerland	5,140	126	41
United Kingdom	56,382	488	116
United States of America	66,071	588	112
Victoria (Australia) ...	2,858	23	124
Total...	504,297	5,508	90

The total number up to March, 1906, has increased to 700,000.

The catalogue begins with the year 1901, but some countries send in their slips rather earlier than others, so that the time interval covered by the investigations to which the table refers is not quite the same for all. Nevertheless, the numbers shown in the table possess a certain interest. I have given in the last two columns the number of journals which different countries take into account, and the ratio of the number of slips to the number of publications. Here again it is difficult to estimate accurately how much value is to be attached to the figures, as there is no uniformity of selection as to what should and what should not be included in the catalogue. Journals which may only very seldom contain any paper which is to be included may unduly diminish the numbers in the last column, which are also affected by the interpretation given as to what is purely technical, and therefore to be excluded. Nevertheless, the comparison between the United Kingdom and France gives the somewhat striking result that, while France is slightly ahead in the number of separate entries it contributes to the catalogue, it takes account of nearly double the number of journals, and the ratio showing the number of entries per journal is therefore very small. In the case of Belgium and Canada, we find also a large number of publications as compared with the slips received. Regard must, however, be had to the fact that in the subject catalogue the same paper may furnish several entries. Especially is this the case in the biological subjects, where several species may be described, for each of which a separate slip must be written out. Hence in any country active chiefly in the discovery of new species the ratio given in the last column of the table would be abnormally large. This is probably the explanation of the figures given for New Zealand. In the opinion of the director of the Central Bureau, the standards adopted by different countries are drawing nearer together as the work proceeds, and before long we may therefore expect to obtain valuable statistical information on the scientific activity in different countries. But this is only an incidental result of the undertaking. It may reasonably be argued that the scientific investigator ought not, before he begins a research, to trouble too much about what may have been done by others in the same direction, but there is no doubt that before publication he should have made himself acquainted with the literature of his subject. A well-arranged catalogue then becomes a necessity, though its value as a means of helping students differs considerably in different subjects.

The governing body of the catalogue is an International Council composed of one representative from each of the countries taking part in the scheme. This council has appointed an executive committee, of which Prof. Armstrong is the chairman.

The Central Bureau for the publication of the catalogue is in London, under the direction of Dr. Henry Forster Morley, who has a staff of thirteen workers under him. There are, in addition, nineteen experts or referees representing the different sciences. The annual office expenses, including salaries, amount to about 2200*l.*; while the expenditure on printing, binding, and publication in the year ending March 1, 1905, amounted to nearly 4900*l.* The two items are just covered by the guarantees of the different countries, which, as already mentioned, take the form of subscriptions for copies of the catalogue, so that it may be said that the central office is self-supporting. After so short a time of working, this success must be a source of considerable satisfaction to Prof. Armstrong and those who have helped to initiate the work; but the expenses incurred in London only represent a fraction of the total cost of the work. Most of the countries establish regional bureaux, which prepare the slips and forward them to London. This really constitutes the most serious part of the work. In Germany, for instance, the Regional Bureau is under the direction of Prof. Uhlworm, one of the university librarians, who is helped by six assistants, and devotes his whole time to the work.

I pass on to an undertaking of a very different kind, but still one which must be included in the class which primarily aims at cataloguing. The accurate determination

of the positions of the stars for a particular period is a work which must precede all exact investigations of their proper motions. Hence it constitutes a fundamental problem of astronomy. The multitude of stars seen on a bright night is bewildering to the casual observer. They are described in poetical writings as innumerable, but when an actual count is made, it is found that their number is really moderate, and it is doubtful if more than two thousand stars have ever been visible to the naked eye at the same time. The use of the telescope considerably increases this number, according to the size of the object-glass or reflecting mirror used. Thus Argelander in his great star catalogue included nearly 324,200 stars which he observed through his telescope of four inches aperture. The advent of photography and the manufacture of suitable lenses to be used in connection with photography increased the astronomical output of a fine night to such an extent that it became possible to make a further and very substantial advance. The International Star Catalogue which is at present being constructed owes its origin chiefly to the hard work of Admiral Mouchez, who was at the time director of the Paris Observatory, and who became converted to the feasibility of the plan by the excellent results obtained by the Brothers Henry, the pioneers in star photography. He was assisted by the energetic support of Sir David Gill, to whom the first suggestion was due. The programme of work was determined upon at an International Conference which met at Paris in the year 1887. Eighteen observatories were to take part in the work, the telescopes to be used were to have an aperture of thirteen inches, and such a focal length that a millimetre on the plate corresponded to one minute of arc. Each observatory had a certain region of the sky assigned to it, and undertook to cover this region four times, twice with plates of short exposure, twice with plates of long exposure, and to measure all the stars appearing on the short-exposure photographs. The long exposures were intended for reproduction in the form of charts, and are only taken by some of the observatories. As there are about 400 stars on each plate, and it takes about 600 plates to cover the share of one observatory once, this means that each observatory has to measure nearly half a million star places, and that the complete catalogue will give the positions of nearly 4½ million stars. This includes all stars down to the eleventh magnitude.

The following is a list of observatories taking part in the work:—For the northern hemisphere, Greenwich, Oxford, Paris, Bordeaux, Toulouse, Potsdam, Helsingfors, Rome, Catania, Algiers. For the southern hemisphere, San Fernando, Tacubaya, Santiago de Chile, Cordoba, Cape of Good Hope, Perth (W. Australia), Sydney, Melbourne.

The work connected with the ultimate completion of the catalogue, and especially the reproduction of the star maps, requires a considerable expenditure. Each country has to make its own arrangements, which in the British Empire usually means that each body concerned has to pay its own expenses. There was, however, in this case some official help. The Astronomer Royal obtained a contribution of 5000*l*. from the Government for the reproduction of charts, and in the case of the Cape of Good Hope the necessary expenses have been met from Imperial funds. Prof. Turner, of Oxford, has obtained a grant of 1000*l*. from the Government grant of the Royal Society, and a further sum of 2000*l*. for publication from the Treasury and the University of Oxford jointly; but the Australian colonies are much hampered by the want of funds, and their work will be delayed in consequence. The four French observatories, on the other hand, are well supported. Each of them has received a Government contribution of 25,700*l*., making a total of well over 100,000*l*. More than half this goes towards the reproductions of the long-exposure photographs as a series of charts, which, however, have proved to be so costly that they will probably never be completed. Indeed, if completed, their utility may to some extent be impaired by the difficulty of storing them in an accessible manner. Prof. Turner calculates that the series of maps will form a pile of paper 30 feet high, weighing about two tons.

I now pass on to those undertakings which are intended to fix standards of measurement, or to establish a general agreement on matters in which uniformity is desirable. The foremost place in this division must be given to the Bureau International des Poids et Mesures, which was established in the year 1873 at Sèvres, near Paris. This bureau was the outcome of an International Commission constituted in 1869, which had for its object the scientific construction of a series of international metric standards. By a convention entered into by the different countries at a diplomatic conference held at Paris in March and April, 1875, means were created for carrying out the work of verifying standards under a new International Metric Committee, and for the purpose of enabling the committee to execute its duties effectually, as well as of securing the future custody and preservation of new metric prototypes and instruments, the Permanent Metric Bureau was founded. The original cost of the bureau was 20,000*l*., and the annual budget was fixed at 3000*l*. for the period during which the prototypes were being prepared, after which time it was expected that the expenditure could be reduced to 2000*l*. In 1901, however, it reached 4000*l*., the maximum to which, by the terms of the convention, the annual budget could be raised. Great Britain did not join the convention until 1884, when it declared its adhesion. A first payment of 1787*l*. was made as entrance fee, and the annual contribution now ranges between 200*l*. and 300*l*. Major MacMahon, to whom I owe the above details, is at present the British representative on the International Committee.

The work carried out at Sèvres is not confined to the reproduction of metric standards, but measurements of precision in various directions have been made with conspicuous success. Scientific thermometry owes much to the International Bureau, and in some respects it may be said that exact thermometry was created there. Prof. Michelson's work, in which the length of the metre was compared directly with the length of a wave of red light, is another classical investigation carried on in the laboratories of the International Bureau. More recently Mr. Guillaume examined the physical properties of alloys, notably those of nickel steel, and proved the possibility of manufacturing a material which shows no sensible expansion with rise of temperature. The importance of metallic rods the length of which does not depend on temperature is obvious, provided they prove to be of sufficient permanence.

Time does not allow me to give an account of the conference and conventions which have led to a general agreement on the standards of electric measurements, but it is a satisfaction to know that these standards are essentially those proposed and first constructed by the British Association. The old British Association ohm no doubt was found to be wrong by more than 1 per cent., but it has remained the prototype of the present international unit, and in principle the old ohm, volt, and unit of current stand as they were given to us by the original committee.[1]

While in the case of scientific units complete agreement is absolutely essential, uniformity is desirable in other cases. There are matters of nomenclature in which confusion has arisen purely from want of general agreement. Thus the great recent improvement in the optical power of telescopes has led to the discovery of many details on the surface of the moon. Small craters or other distinctive features named by one observer were not correctly identified by another, so that at the present time the same name is applied to quite different things by different observers. It is quite clear that an international agreement in lunar nomenclature is called for.

There are other deficiencies of uniformity which perhaps appear trivial, but which yet lead to the waste of a good deal of time. Such, for instance, is the position of the index in scientific books. The index is placed sometimes at the beginning, sometimes at the end, and sometimes neither at the beginning nor at the end. Some books have no index,

[1] The original committee was appointed in 1861, and consisted of Profs. A. Williamson, C. Wheatstone, W. Thomson (Lord Kelvin), W. H. Miller, Dr. A. Matthiessen, and Mr. F. Jenkins. In the following year, Messrs. C. Varley, Balfour Stewart, C. W. (Sir William) Siemens, Prof. Clerk Maxwell, Dr. Joule, Dr. Esselbach, and Sir Charles Bright were added to the committee.

some have two, one for the subject-matter and one for names of authors. The loss of time which arises from one's ignorance as to where to look for the index cannot be estimated simply by what is spent on the search, but must include the time necessary to regain the placidity of thought which is essential to scientific work.

It is time we turned to the more serious aspect of those international associations which directly aim at an advance of knowledge. Mathematicians have drawn interesting conclusions from the contemplation of ideal beings who are confined to live on a surface and have no knowledge of anything that goes on outside that surface. Our Euclidean geometry would be unknown to them, and spiritualistic tricks could be performed by anyone possessing, even to a minute extent, the power of controlling a third dimension. It is, I think, worth while investigating the extent of the direct knowledge of a third dimension, which makes us so infinitely superior to the two-dimensional beings. We are able, no doubt, through our eyes, to penetrate the depths of space, but we should be unable to interpret the impressions of our sight if we had not some tangible knowledge of three dimensions, and had not learned to bring the sense of sight and the sense of touch into harmony. But our sense of touch is confined to a very small distance from the ground on which we stand, and independently of artificial means of raising ourselves above the surface of the earth, a layer 6 feet or 7 feet thick represents the extent of our three-dimensional knowledge. Compared with the radius of the earth, the thickness of such a layer is small enough, for it would represent only the thickness of a sheet of paper on a sphere having a radius of 250 metres; compared with the solar system, and even more so with stellar distance, a thickness of layer of 8 feet seems infinitesimal. Yet the infinitesimal is essentially different from the zero, and even were our bodies much smaller than they are we should continue to have the power to interpret three dimensions. These considerations show how important it is for us to increase our knowledge of the earth itself, and to extend it so far as possible to the depth below our feet and the height above our heads.

In passing from the arbitrary units to which we refer our terrestrial measurements of length, to the scale on which we measure the dimensions of the solar system, and from them to stellar distances, the magnitude of the earth's radius or circumference forms an all-important intermediate quantity. One of the first acts of the French Academy of Sciences, founded in 1666, consisted in organising the work of accurately measuring the dimensions of the earth, and this at once enabled Newton to confirm his celebrated theory of universal gravitation. As improvements in the methods of measuring kept pace with the work actually accomplished our knowledge steadily increased, but we are still improving on it. New problems have arisen requiring more minute study, and the measurements of the shape and size of the earth still remain a question of the first importance. The actual surveys and triangulation required for the purpose are of necessity left to the initiative of individual States or to the combination of the States primarily concerned, but the general discussion of results, so far as they apply to the earth as a whole, is entrusted to an International Geodetic Association, which at present consists of twenty-one States. These, together with their annual contributions to the general fund, are entered in the following table:—

	£		£
Belgium	80	Austria	300
Denmark	40	Portugal	80
Germany	300	Roumania	80
France	300	Russia	300
Greece	40	Sweden	40
Great Britain	300	Switzerland	40
Italy	300	Servia	40
Japan	300	Spain	150
Mexico	150	Hungary	150
The Colonies of the Netherlands	40	United States of America	300
Norway	40		

The Central Bureau of this association is attached to the Royal Geodetic Institute of Potsdam, which is under the distinguished direction of Prof. Helmert, who acts as secretary to the association.

The question of measuring the size of the earth depends to a great extent on the measurement of arcs of meridian. So long as we were confined to Europe for the measurements of these arcs they remained necessarily short, but larger and larger portions of our globe have become accessible to the theodolite, and there is especially one arc which is distinguished by the fact that it is the longest possible which can be traced along the land covering the earth's surface. It runs about 30° east of Greenwich, and a large portion of it passes through Africa. Owing to the great energy and enterprise of Sir David Gill, the work of measuring this arc is well in hand, though at the present moment want of funds threatens to endanger its completion. The Egyptian Survey entrusted to Captain Lyons will no doubt receive continued support, and by an arrangement entered into between representatives of the German Government and Sir David Gill at a conference held in Berlin in 1896, Germany undertook to carry out the triangulation through her territory in South-West Africa. I understand this work has been done, and the triangulation of the Transvaal and the Orange River Colony is also complete. There is still a gap in the southern part of Rhodesia, but there is every hope that this will soon be bridged over. The British South African Company has spent 36,000*l.* on the work and thus has very materially assisted an important enterprise. When the African arc is complete it will be connected with the Russian and Roumanian arcs so as to form a continuous chain of 105° extending from 70° north to 35° south latitude. I have to point out, however, that, in the opinion of those best able to judge, the completion of the South African arc is not the only undertaking to which this country is called upon to pay attention. The triangulation of our own island, excellent as it was when first made, has fallen below the accuracy required in modern geodetic work. Until our fundamental triangulation has been repeated, the sums which at present are being spent on the detailed survey might find a better use.

The main result of the recent work has been that, so far as present measurements allow us to judge, the surface of the ocean can be well represented by a surface of revolution, and it is not necessary to assume a more complicated shape. The mean radius of the earth is determined to about 100 metres, which means a possibility of doubt amounting to about 1 part in 60,000.

Geodetic work is, however, not confined to measurements of length, for important information may be derived from an exact knowledge of the acceleration of gravity over its surface. The introduction of the pendulum of short length intended for relative and not for absolute measurement has greatly facilitated this work, and it is hoped that these pendulum observations may be carried out over still more extended regions. India is setting a good example. It has measured two arcs of meridian, and the gravitational work carried out by Captain Burrard, and recently published by the Royal Society, is of primary importance. But otherwise English colonies require encouragement to do more. I am assured that measurements of the gravitational constant in Canada would be of the greatest importance.

The bearing of such work on our knowledge of the earth may perhaps be illustrated by one example. It has often been a matter of wonder how mountain chains such as the Himalayas could rest on the lower strata of the earth without crushing them and forcing them in by the pure power of their weight, and the most plausible theory to account for this was found in the idea first suggested by Pratt, that the mountain chains must not be compared with a large weight resting on an under-structure, but rather with a lighter body partially immersed in a heavier one. Mountains, according to this theory, float in the body of the earth very much like icebergs float in water. The truth of this theory can only be tested by accurate measurement of the gravitational force, from which information may be derived on the distribution of density in the earth's strata near the surface. On the whole, the measurements so far available have confirmed Pratt's hypothesis.

More recently another problem has occupied the atten-

tion of the International Geodetic Association, and, owing to its immediate interest, has absorbed the greater portion of its funds. The astronomical world was surprised by the announcement of Prof. Chandler that he was able to demonstrate from existing observations that the earth's pole describes a closed curve taking about fourteen months to complete a revolution. The possibility of a periodic shift of the earth's axis was foreseen by Euler, who calculated the time of revolution to be ten months; but observations did not show a sensible period of that duration. No one apparently before Chandler tried to see whether another period beyond a small annual one existed. The discrepancy between the calculated ten and the observed fourteen months was cleared up by Prof. Newcomb, who pointed out that Euler's calculation was based on the supposition that the earth is an absolutely rigid body. Any yielding would increase the length of the period; in fact, the earth must be more rigid than steel in order that the period should be as short as fourteen months. This shows how indirect information on the physical properties of the earth may be obtained sometimes in an unexpected manner, the periodic revolution of the pole leading to an estimate of the average rigidity of the interior of the earth. The total displacement of the pole of the earth from its average position is small, never amounting to more than 8 metres. The accuracy with which that displacement can be measured is a testimony to the excellence of our astronomical observations. It is a type of work in which cooperation is absolutely necessary. The subject has received additional interest through the suggestion made by Prof. Milne in his recent Bakerian lecture that seismic disturbances may be caused by the changes in the position of the earth's axis. Considering that the distortions in the earth are sufficient to increase the periodic revolution of the pole from ten to fourteen months, this suggestion is well worth investigation, and the 300*l.* per annum spent by this country in support of the work of the Geodetic Association will be well employed if it allows the vagaries of our pole to be more closely studied and all the dimensional quantities of the surface of the earth to become more accurately known.

The contributions received by the Central Bureau of this association from the participating States amount to about 3000*l.*, and there is a balance which at the end of 1904 amounted to more than 5000*l.* The expenditure during 1905 was nearly 5000*l.*, reducing the balance by 2000*l.* The principal items of the expenditure were formed by contributions towards the maintenance of six stations in the northern and two stations in the southern hemisphere for carrying out the observations relating to the changes of the position of the earth's axis. The whole cost of this service is about 4450*l.* The honorarium of the secretary is 250*l.*, which, together with the cost of printing, postage, and a small item for grants toward special scientific work, makes up the expenditure. No charges are made for office expenses, which are defrayed by the Prussian Government.

The geodetic work indirectly gives us valuable, though only partial, information on the interior of the earth, but it confines itself in the main to the surface of the globe; the investigation of our atmosphere carries us beyond.

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

DR. J. P. HILL has been appointed to the Jodrell chair of zoology at University College, London.

AT King's College, London, Dr. C. S. Myers has been appointed professor of psychology (including experimental psychology), and Mr. H. S. Allen senior lecturer in physics.

THE Rev. T. C. Fitzpatrick, dean and supernumerary fellow of Christ's College, has been elected president of Queens' College, Cambridge, in succession to the Bishop of Ely.

A COURSE of five free public lectures is to be given, in accordance with the will of Mr. Brown, in the physiological laboratory of the University of London on July 9, 11, 13, 16, and 18, by Prof. T. G. Brodie, F.R.S., on the "Secretion of Urine under Normal and under Pathological Conditions."

THE trustees of the Brooklyn Polytechnic Institute have, we learn from *Science*, subscribed 160,000*l.* toward the 400,000*l.* necessary to endow the proposed extension of the institute, affording facilities for more advanced work. In addition to this handsome provision for higher education, our contemporary announces that Mr. and Mrs. Jacob Turtellout, of Minneapolis, have offered to give 80,000*l.* to build and endow an academy for the town of Thompson, Conn., and that Dr. Henry M. Saunders, of New York, a trustee of Vassar College, has given 15,000*l.* for the erection of a building as a memorial to his wife.

THE current number of *Macmillan's Magazine* contains an article by Mr. A. C. Passmore on technical education, in which some of the weaknesses of systems of instruction of this type are summarised. The need is insisted upon for adequate preliminary training of a suitable kind for students beginning courses of technology. It is urged that instead of being in such a hurry to provide technical schools it would be worth while to consider the qualifications and fitness of the teachers. The examination system is cited as one of the chief causes conspiring to make British technical education unsatisfactory. But the author appears to be unacquainted with the work being done in many of the great municipal technical schools, and to have ceased his educational observations some ten or fifteen years ago. Conditions at present are better than Mr. Passmore paints them.

AMONG the bequests made by Mr. F. W. Webb, who died on June 4, we notice the following:—2000*l.* to Owens College, Manchester, to establish for the benefit of employees and sons of employees of the London and North-Western Railway a "Webb" scholarship tenable at Owens College, Manchester; 2000*l.* to the University College of Liverpool for a similar purpose there as defined for Owens College, Manchester; 1000*l.* to the Institute of Civil Engineers for providing annually a "Webb Medal," and a premium of books to be awarded for the best paper on railway machinery.

THE annual assembly and prize distribution at University College, London, on Tuesday, July 3, was of more than usual interest from the fact that the friends of Prof. Carey Foster had taken the opportunity of then presenting to the college the portrait of Prof Foster which has been painted by Mr. Augustus John. The presentation was made by Prof. F. T. Trouton, who recalled the fact that Prof. Foster was the first to introduce practical laboratory teaching in physics into England. Many of the methods devised by him in the development of his laboratory courses are to-day recognised as standard ones. For instance, every student has to go through and know his Carey-Foster Bridge as surely and regularly as at school he has to pass the fifth proposition of the first book of Euclid. The example set by Foster was followed in laboratory after laboratory, until to-day there is not a town without its course of experimental physics. Prof. Trouton concluded by hoping that though the portrait represented its subject as an older man than he really is, yet his useful life might be spared until the portrait may become that of a much younger man. The Right Hon. Lord Reay, G.C.S.I., who received the portrait on behalf of the college, referred to the great impetus which the study of physics had received by his work and writings, which are characterised by great clearness and lucidity. More especially he referred to the debt owed to Prof. Foster by the college, of which he became the first principal at a time at which great tact and knowledge were required in connection with the delicate negotiations leading to the incorporation of the college in the University of London. His lordship concluded by presenting a replica of the portrait to Mrs. Carey Foster. Prof. Foster, in acknowledging the presentations, alluded to the interval of fifty-three years since he was first present at a ceremony of the same kind. In one respect the present ceremony was of historical interest, inasmuch as it was the last ceremony to be held by the college before its incorporation. He looked forward to the advantages arising from this incorporation. The prominent defect in the higher teaching in London is the dispersion of the large